New Frontiers in Green Buildings
Toxins in Building Materials

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INFORM

- 30-year-old, national, non-profit environmental research and outreach organization
- Key research areas:
  - Chemical Hazards Prevention
  - Solid Waste Prevention
  - Sustainable Transportation

INFORM works with government agencies, schools and businesses to facilitate business practices that are environmentally preferable.
New Frontiers Project

- EPA funded research and outreach projects
- Began with work in New York and New Jersey
- Focus on persistent bioaccumulative toxins – mercury, lead, cadmium, PCBs, dioxins… – (PBTs)
Toxins in Products

- 92% of PBTs leave factories in products
- In 2001 over 151 tons of mercury was added to products*
- 14 billion pounds, or 75%, of polyvinyl chloride manufactured is used in building materials**
- There is no requirement to label products that contain PBTs

*Maine Department of Environmental Protection “A Strategy to Reduce the Mercury Content of Products” January 2003
**Healthy Building Network “PVC Fact Sheet”

2005 GLRPPR Summer Conference
26 August 2005
PBTs in Building Products

- Mechanical systems
- Lighting systems
- Vinyl in plumbing, roofing, interior finishes, window frames, house siding...
- Brominated flame retardants in furniture and electronics
- Cadmium in solders and metal plating
Mercury in Mechanical Systems

- Heating
- Cooling
- Ventilation
- Site water control
- Fresh water supply
- Water purification
- Sewage
- Gas supply

Including:
- Tilt switches
- Flow controls
- Aqua stats
- Pressure stats
- Fan limit controls
- Many other examples
Mechanical Systems Regulators Use Mercury

- Regulatory and measuring devices contain from a single gram up to a pound of mercury

- Overall information on mercury content is not available
Mercury-Free Mechanical Systems

- Cost effective alternatives meet performance specification
- Write clear mercury restrictions
- Ask for mercury-free specifications

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Lighting uses of Mercury

- In 2001 12%, or 18 tons, of mercury intentionally added to products went into lighting
- 680 million lamps, containing 13 tons of mercury entered the waste stream in 2004
- Up to 80% of these went to municipal landfills and incinerators
Energy Efficiency

- Coal-fired electric power plants are the nation's single-largest source of mercury emissions
- Energy efficient technology relies on mercury
Milligrams Matter

- Reducing the amount of mercury per lamp will reduce environmental mercury releases.
- Lamps can break during use, sending volatilized mercury into the air we breathe.
Low-Mercury Lighting Solutions

- Incorporate low-mercury along with energy efficiency and lamp life into specifications
- Technology improvements – ex: induction lamps, HO T5 lamps

These lighting products will meet design criteria, are cost competitive, and energy efficient.
# Mercury Content of T8 Lamps

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Mercury Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Philips Alto</td>
<td>3.5 milligrams</td>
</tr>
<tr>
<td>GE</td>
<td>6 milligrams</td>
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<tr>
<td>Sylvania</td>
<td>6 to 8 milligrams</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Medium-Sized Retailer</th>
<th>200, 10,000 Square Foot Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Philips Alto, 3.5 mg</td>
<td>250 mg in 10 yrs</td>
</tr>
<tr>
<td>GE or OSI, 6 mg</td>
<td>350 mg in 10 years</td>
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</table>
T5 High-Output Fluorescents

- Replace metal-halides in high-bay applications
- Save money in electrical costs

<table>
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<tr>
<th>Medium Sized Retailer</th>
<th>200 facilities:</th>
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<tbody>
<tr>
<td></td>
<td>10,000 square feet each</td>
</tr>
<tr>
<td>High-output T5</td>
<td>81 – 290 grams Hg per decade</td>
</tr>
<tr>
<td>Metal-halides</td>
<td>580 – 940 grams Hg per decade</td>
</tr>
</tbody>
</table>
Fluorescent Induction Lamps

- Rated life of 100,000 hours
- Resist extremes of temperature, vibration

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<tr>
<td>Fluorescent Induction Lamps</td>
<td>130 -160 Grams Hg per decade</td>
</tr>
<tr>
<td>Metal Halides</td>
<td>580 – 940 Grams Hg per decade</td>
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</table>
Mercury in Existing Buildings

- Most mercury in buildings is in existing structures
- Clearly label all mercury added devices
- Write demolition specifications
Vinyl Products

For more information see:

- Healthy Building Network PVC Fact Sheet at: http://www.healthybuilding.net/pvc/index.html
- Environmental Impacts of Polyvinyl Chloride Building Materials by Joe Thorton, Ph.D.
- Upcoming INFORM PBT report
Vinyl

- Toxins in Manufacturing
- Lethal additives
- Use risks
- Recycling issues
- Alternatives
Toxic Manufacturing

- Unavoidably generated in manufacture:
  - Polychlorinated dioxins and furans
  - PCBs
  - Hexachloroethane
  - Hexachlorobutadiene
  
  All of the above chemicals are on the EPA’s 31 Priority Chemicals List

- Present in at least trace amounts in chlorine gas:
  - Hexachloroethane
  - PCB
  - Octachlorostyrene (OCS)
Additives

- Stabilizers and plasticizers including
  - Lead
  - Cadmium
  - Phthalates
Use Risks

- Stabilizers and plasticizers can leach, flake or outgas – increasing risks of asthma, cancer, and lead poisoning
- Deadly fire hazard – releases hydrogen chloride and dioxin
- Toxins in products used to maintain flooring
Can not Be Readily Recycled

- Additives in PVC cause problems in recycling
- In some cases is considered a contaminant
- Best cradle-to-cradle scenario is a same-product loop
Uses and Alternatives

- **Piping** – replace with cast iron, steel, vitrified clay or high-density polyethylene
- **Siding** – replace with fiber-cement board, stucco, wood, brick or polypropylene
- **Roofing** – replace with TPO, EPDM, metal roofing
Uses and Alternatives

- Electrical insulation and sheathing – replace with linear low-density polyethylene, thermoset crosslinked polyethylene (XLPE)
- Windows and doors – replace with wood, fiberglass or aluminum
Uses and Alternatives

- Resilient flooring – replace with linoleum, bamboo, ceramic, wood, recycled rubber, concrete or nonchlorinated plastics
- Carpet backing – replace with unbacked carpet or natural fiber backing
- Wall covering – replace with natural fibers
- Wall protection – replace with wood, or metal
INFORM Mercury Fact Sheets

- Specifying and Sourcing Mercury-Free HVAC and Building Equipment
- The Low-down on Mercury in Fluorescent Lamps
- Mercury-Containing Lamps and EPA’s Toxicity Characteristic Leaching Procedure
- Environmentally Preferable LED Exit Signs: Saving Money and Protecting the Environment Through Energy Efficiency
- High-bay Lighting: Opportunities for Mercury Reduction and Energy Efficiency
New Frontiers in Green Building: Toxins in Construction

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